REMARKS

Applicants wish to thank the Examiner for considering the present application. In the Final Office Action dated May 18, 2005, Claims 1-23 are pending in the application. Applicants respectfully request the Examiner for reconsideration.

Claims 1-8, 16 and 17 stand rejected under 35 U.S.C. §103(a) over *Schleiss* (6,298,454) in view of *Williams* (5,754,451) and *Reuben* (6,656,683). Claims 9-14, 18, 20 and 21-23 stand rejected under 35 U.S.C. §103(a) over *Schleiss* (6,298,454) in view of *Williams* (5,754,451) and *Reuben* (6,656,683) in further view of *Taguchi* (5,807,256).

Claim 1 is directed to a diagnostic system for a data acquisition system that includes a computer controller coupled to the data acquisition system, a display device coupled to the computer controller. The computer controller receives data from the data acquisition system, diagnosing a problem in response to said data. The controller generates a screen display corresponding to a schematic representation of the data acquisition system. The controller generates screen indicia on the display device corresponding to a location of the problem on the schematic representation of the data acquisition system. Claim 1 recites that the controller generates a second screen display comprising a boxplot illustrating normalized raw data. This is illustrated in Figure 3 and is described in paragraph 18. The boxplot display is not taught or suggested in either the *Schleiss* or *Wiliams* reference. The Examiner agrees on page 3 of the of the Final Office Action.

Claims 1, 7, and 16 have been amended to clarify that the boxplot corresponds to the schematic representation.

The Examiner cites the *Reuben* reference for a boxplot. However, Applicants submit that the *Reuben* reference merely shows a histogram. The Applicants have included a definition from a website of an Engineering Statistics Handbook which illustrates the difference between a boxplot and a histogram. Applicants respectfully submit that a boxplot is substantially different than a histogram and therefore the *Reuben* reference does not teach or suggest a boxplot. Applicants therefore respectfully request the Examiner to reconsider the rejection of Claim 1.

Claim 7 is believed to be allowable for the same reasons set forth in Claim 1.

Claim 16 is directed to a method that contains similar limitations with respect to the schematic representation of the data acquisition system and the screen indicia and the boxplot. Therefore, Claim 16 is also believed to be allowable for the same reasons set forth above. Likewise, Claims 2-6 are also believed to be allowable since they are dependent upon allowable independent claims. Therefore, as the teachings of the claims are not found in the combination

of the *Schleiss* reference, the *Williams* reference or the Reuben reference. Applicants respectfully request the Examiner for reconsideration.

The remaining dependent claims are believed to be allowable for the same reasons set forth above. *Taguchi* also does not teach a normalized boxplot.

Claims 6 and 15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Schleiss* in view of *Howards Komitzinsky* (6,598,011). Claims 6 and 15 recite further limitations to Claims 1 and 15 relative to a web browser and a controller generating screen indicia through the web browser. The *Howards Komitzinsky* reference does not teach or suggest the use of a boxplot nor the use of a schematic representation. Applicants therefore respectfully submit that these claims are also allowable for the same reasons set forth above with respect to Claims 1 and 7.

Applicants respectfully believe that all rejections are overcome. Should the Examiner have any further questions or comments, the Examiner is directed to contact the undersigned directly. Please charge any fees required in the filing of this amendment to deposit account 50,0476.

Respectfully submitted,

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1.3.3.14. Histogram

Purpose: Summarize a Univariate Data Set

The purpose of a histogram (Chambers) is to graphically summarize the distribution of a univariate data set.

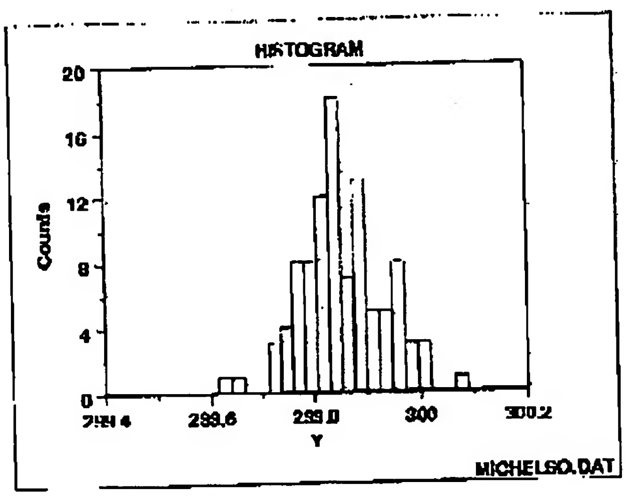
The histogram graphically shows the following:

1. center (i.e., the location) of the data;
2. spread (i.e., the scale) of the data;
3. skewness of the data;
4. presence of outliers; and
5. presence of multiple modes in the data.

These features provide strong indications of the proper distributional model for the data. The probability plot or a goodness-of-fit test can be used to verify the distributional model.

The examples section shows the appearance of a number of common features revealed by histograms.

Sample Plot



Definition

The most common form of the histogram is obtained by splitting the range of the data into equal-sized bins (called

classes). Then for each bin, the number of points from the data set that fall into each bin are counted. That is

- Vertical axis: Frequency (i.e., counts for each bin)
- Horizontal axis: Response variable

The classes can either be defined arbitrarily by the user or via some systematic rule. A number of theoretically derived rules have been proposed by Scott (Scott 1992).

The cumulative histogram is a variation of the histogram in which the vertical axis gives not just the counts for a single bin, but rather gives the counts for that bin plus all bins for smaller values of the response variable.

Both the histogram and cumulative histogram have an additional variant whereby the counts are replaced by the normalized counts. The names for these variants are the relative histogram and the relative cumulative histogram.

There are two common ways to normalize the counts.

1. The normalized count is the count in a class divided by the total number of observations. In this case the relative counts are normalized to sum to one (or 100 if a percentage scale is used). This is the intuitive case where the height of the histogram bar represents the proportion of the data in each class.

2. The normalized count is the count in the class divided by the number of observations times the class width. For this normalization, the area (or integral) under the histogram is equal to one. From a probabilistic point of view, this normalization results in a relative histogram that is most akin to the probability density function and a relative cumulative histogram that is most akin to the cumulative distribution function. If you want to overlay a probability density or cumulative distribution function on top of the histogram, use this normalization. Although this normalization is less intuitive (relative frequencies greater than 1 are quite permissible), it is the appropriate normalization if you are using the histogram to model a probability density function.

Questions The histogram can be used to answer the following questions:

1. What kind of population distribution do the data come from?

2. Where are the data located?
3. How spread out are the data?
4. Are the data symmetric or skewed?
5. Are there outliers in the data?

Examples

1. Normal
2. Symmetric, Non-Normal, Short-Tailed
3. Symmetric, Non-Normal, Long-Tailed
4. Symmetric and Bimodal
5. Bimodal Mixture of 2 Normals
6. Skewed (Non-Symmetric) Right
7. Skewed (Non-Symmetric) Left
8. Symmetric with Outlier

Related Techniques

Box plot
Probability plot

The techniques below are not discussed in the Handbook. However, they are similar in purpose to the histogram. Additional information on them is contained in the Chambers and Scott references.

Frequency Plot
Stem and Leaf Plot
Density Trace

Case Study

The histogram is demonstrated in the heat flow meter data case study.

Software

Histograms are available in most general purpose statistical software programs. They are also supported in most general purpose charting, spreadsheet, and business graphics programs. Dataplot supports histograms.

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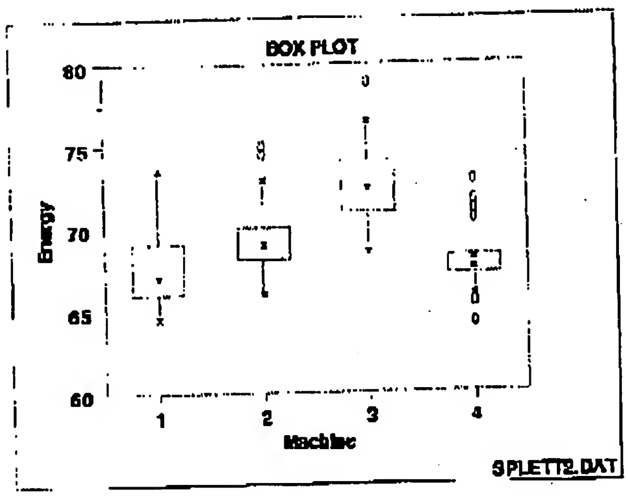
1.3.3.7. Box Plot

Purpose: Check location and variation shifts

Box plots (Chambers 1983) are an excellent tool for conveying location and variation information in data sets, particularly for detecting and illustrating location and variation changes between different groups of data.

Sample Plot: This box plot reveals that machine has a significant effect on energy with respect to location and possibly variation



This box plot, comparing four machines for energy output, shows that machine has a significant effect on energy with respect to both location and variation. Machine 3 has the highest energy response (about 72.5); machine 4 has the least variable energy response with about 50% of its readings being within 1 energy unit.

Definition

Box plots are formed by

Vertical axis: Response variable
Horizontal axis: The factor of interest

More specifically, we

1. Calculate the median and the quartiles (the lower quartile is the 25th percentile and the upper quartile is

the 75th percentile).

2. Plot a symbol at the median (or draw a line) and draw a box (hence the name--box plot) between the lower and upper quartiles; this box represents the middle 50% of the data--the "body" of the data.

3. Draw a line from the lower quartile to the minimum point and another line from the upper quartile to the maximum point. Typically a symbol is drawn at these minimum and maximum points, although this is optional.

Thus the box plot identifies the middle 50% of the data, the median, and the extreme points.

Single or multiple box plots can be drawn

A single box plot can be drawn for one batch of data with no distinct groups. Alternatively, multiple box plots can be drawn together to compare multiple data sets or to compare groups in a single data set. For a single box plot, the width of the box is arbitrary. For muliple box plots, the width of the box plot can be set proportional to the number of points in the given group or sample (some software implementations of the box plot simply set all the boxes to the same width).

Box plots with fences

There is a useful variation of the box plot that more specifically identifies outliers. To create this variation:

1. Calculate the median and the lower and upper quartiles.

2. Plot a symbol at the median and draw a box between the lower and upper quartiles.

3. Calculate the interquartile range (the difference between the upper and lower quartile) and call it IQ.

4. Calculate the following points:

   L1 = lower quartile - 1.5*IQ
   L2 = lower quartile - 3.0*IQ
   U1 = upper quartile + 1.5*IQ
   U2 = upper quartile + 3.0*IQ

5. The line from the lower quartile to the minimum is now drawn from the lower quartile to the smallest point that is greater than L1. Likewise, the line from the upper quartile to the maximum is now drawn to the largest point smaller than U1.

6. Points between L1 and L2 or between U1 and U2 are drawn as small circles. Points less than L2 or greater than U2 are drawn as large circles.

Questions

The box plot can provide answers to the following questions:

1. Is a factor significant?
2. Does the location differ between subgroups?
3. Does the variation differ between subgroups?
4. Are there any outliers?

Importance: Check the significance of a factor

The box plot is an important EDA tool for determining if a factor has a significant effect on the response with respect to either location or variation.

The box plot is also an effective tool for summarizing large quantities of information.

Related Techniques

Mean Plot
Analysis of Variance

Case Study

The box plot is demonstrated in the ceramic strength data case study.

Software

Box plots are available in most general purpose statistical software programs, including Dataplot.